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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 05638.0018

U.S. APPLICATION NO. (If known, see 37CFR1.5): 10/088602

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/08815	September 9, 2000	September 22, 1999

TITLE OF INVENTION
HARD CANDY WITH IMPROVED STORAGE STABILITY

APPLICANT(S) FOR DO/EO/US
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Applicant(s) herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c)(2)).
   a. ☒ is attached hereto (required only if not communicated by the International Bureau.
   b. ☐ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed with the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371 (c)(2)).
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154 (d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3)).
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ Information Disclosure Statement under 37 CFR 1.97 and 1.98
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A Substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154 (d)(4).
19. ☐ A second copy of the English language translation of the international application 35 U.S.C. 154 (d)(4).
20. ☒ Other items or information:
   a. ☒ Copy of cover page of International Publication No. WO01/21005A1
   b. ☐ Copy of Notification of Missing Requirements.
   c. ☒ Verification of Translation

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U.S. APPLICATION NO (If known, see 37CFR 1 5) 10/088602	INTERNATIONAL APPLICATION NO. PCT/EP00/08815	ATTORNEY'S DOCKET NUMBER 05638.0018

21. ☒ The following fees are submitted:

	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1040.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search fee (37 CFR 1.445(a)(2)) paid to USPTO **$740.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTOand all claims satisfied provisions of PCT Article 33 (1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$890.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	$	

CLAIMS	NUMBER FILED		NUMBER EXTRA	RATE		
Total Claims	18	- 20 =	0	x $18 00	$	
Independent Claims	1	-3 =	0	x $84.00	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+$280.00	$280.00	
				TOTAL OF THE ABOVE CALCULATIONS =	$1170.00	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.					$	
				SUBTOTAL =	$1170.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest priority date (37 CFR 1.492(f)).					$	
				TOTAL NATIONAL FEE =	1170.00	
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property. +					$	
				TOTAL FEES ENCLOSED =	$1170.00	
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a. ☒ A check in the amount of $ 1170.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

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NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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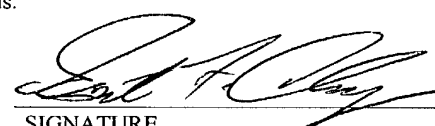
DATED: March 21, 2002



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Hard Caramels with Improved Storage Stability

Description

The present invention relates to hard caramels containing 1-O-α-D-glucopyranosyl-D-mannitol (referred to below as 1,1-GPM) and methods of producing the same.

European Patent Application 0 303 295 A2 describes a hard caramel containing meso-erythritol as the main component plus other saccharides such as sucrose, glucose, malt syrup, fructose, isomaltulose and isomaltose. U.S. Patent 4,587,119 describes the use of isomaltulose as a sucrose substitute in certain foods and pharmaceutical products. U.S. Patent 4,971,798 discloses hard caramels containing hydrogenated isomaltulose. Hydrogenated isomaltulose is an almost equimolar mixture of 6-O-α-D-glucopyranosyl-D-sorbitol (referred to below as 1,6-GPS) and the stereoisomer 1,1-GPM. This mixture is also known by the brand name Palatinit and is referred below as isomalt. Isomalt is produced by isomerizing sucrose enzymatically, separating the resulting isomaltulose from the other components such as trehalulose and isomaltose, and then hydrogenating the isomaltulose to form 1,6-GPS and 1,1-GPM, whereupon 1,1-GPM crystallizes out as the dihydrate. European Patent 0 625 578 B1 mentions caramels containing a sweetener mixture of 1,1-GPS (1-O-α-D-glucopyranocyl-D-sorbitol), 1,1-GPM and 1,6-GPS. It is explained there that increasing the 1,1-GPS content suppresses the tendency of 1,1-GPM to crystallize out. Hard caramels are not mentioned in this publication. German Patent 195 32 396 C2 describes hard caramels containing a mixture enriched with 1,6-GPS or 1,1-GPM. A 1,1-GPM-enriched mixture is understood to be a mixture of 1,6-GPS and 1,1-GPM having a ratio of 1 percent-by-

weight (wt%) : 99 wt% to 43 wt% : 57 wt% 1,6-GPS to 1,1-GPM, i.e., it contains 57 wt% to 99 wt% 1,1-GPM. The hard caramels disclosed specifically in this publication have a 1,1-GPM content of 85 wt%. However, the hard caramels described there are characterized in that they have a tendency to undergo recrystallization, especially when stored for a long period of time, whereupon crystallized areas develop on the surface of the hard caramels or cloudiness develops inside them. Both phenomena are unwanted, because they can influence both the sensory properties and the marketability.

The technical problem on which the present invention is based therefore consists of providing hard caramels that have an improved stability in storage.

The solution to this technical problem is achieved by providing a hard caramel that has a 1,1-GPM content of 52 wt% to 60 wt% (amounts in wt% are always based on the total dry solids of the hard caramel, unless otherwise indicated) and a sorbitol content of 0.5 wt% to 3.5 wt%. In a preferred embodiment, the hard caramel has a 1,1-GPM content of 54 wt% to 58 wt%, preferably 55 wt% to 57 wt%.

In another preferred embodiment, the aforementioned hard caramel has a sorbitol content of 1 wt% to 1.5 wt%.

However, in another preferred embodiment, this invention also relates to hard caramels having a 1,1-GPM content of 52 wt% to 60 wt%, especially 54 wt% to 58 wt%, and a sorbitol content of 1.8 wt% to 3.5 wt%.

In a preferred embodiment, this invention relates to a hard caramel as defined above, containing 54 wt% to 56 wt% 1,1-GPM and 1.8 wt% to 3.5 wt% sorbitol, especially 55 wt% 1,1-GPM, and 3 wt% sorbitol.

In another preferred embodiment, the hard caramel according to this invention has a 1,1-GPM content of 56 wt% to 60 wt% and a sorbitol content of 0.8 wt% to 1.8 wt%.

The hard caramels according to this invention are surprisingly characterized by an especially low water uptake, and they have a much lower tendency towards recrystallization than known hard caramels. Their stability in storage is thus greatly improved. The formation of crystalline areas on the surface of the hard caramels as well as cloudy zones inside the hard caramels is entirely or mostly prevented according to this invention, or it occurs only much later.

Moreover, an increased 1,1-GPM content in a hard caramel containing color-producing substances in comparison with a 1:1 ratio of 1,1-GPM to 1,6-GPS is characterized in that the hard caramels have an increased color stability or a reduced color-producing tendency.

In conjunction with the present invention, a hard caramel is understood to be an amorphous product which can be manufactured by removing water from an aqueous solution or suspension of a sweetener such as a sugar substitute by evaporating the water, so that the solution or suspension of the sugar substitute is concentrated, and then this concentrate is converted to any desired form, e.g., by casting or stamping. Hard caramels may also be produced by melt extrusion of a dry sweetener mixture. Of course, other ingredients such as flavorings, colorings, intense sweeteners or the like may also be added to the hard caramels in their production.

This invention thus provides for the hard caramel according to this invention to contain 1,1-GPM in an amount of 52 wt% to 60 wt% and sorbitol in an amount of 0.5 wt% to 3.5 wt%. The hard caramel may also contain other additives or auxiliary substances, such as other sweeteners, intense sweeteners, coloring agents, flavors and flavoring agents, food-compatible acids, preservatives, active ingredients, fillers, fat substitutes, mineral salts containing, for example, Ca^{2+} or Mg^{2+} or binders. Thus, the caramel according to this invention may

contain sugar alcohols, especially maltitol, hydrogenated starch hydrolysates (HSH), erythritol, xylitol, lactitol and/or mannitol. Mannitol may be used in a quantity of 0.4 wt% to 4 wt% in a preferred manner. According to this invention, in particular a medicinally active substance which has a prophylactic or therapeutic effect on the human or animal body may be added as an active ingredient, e.g., antihistamines, antibiotics, fungicides, microbicides, hexylresorcinol, dextromethorphan hydrobromide, menthol, nicotine, caffeine, vitamins, zinc, eucalyptus, benzocaine, cetylpyridinium, fluorides, phenylpropanolamine or other pharmaceutically active substances.

The hard caramels according to this invention may contain flavoring agents such as vegetable oils and fruit oils, citrus oils, flower oils or leaf oils, oils from cherry, menthol, eucalyptus, peppermint, honey or green mint, fruit essences, green tea extract or natural or synthetic coloring agents, etc. These flavoring agents are preferably added in an amount of 0.05 wt% to 3 wt%. In a preferred embodiment of this invention, the hard caramels may also contain binders such as alginate, cellulose, gelatin or vegetable gums.

It is also possible for intense sweeteners to be added to the hard caramels according to this invention to increase the sweetening power; these would include aspartame, cyclamate, acesulfame K, saccharine, sucralose, alitame, neohesperidine DC, stevioside, thaumatin or the like.

Synthetic or natural coloring agents may be used according to this invention as the coloring agents. Suitable synthetic coloring agents include, for example, erythrosin, indigo carmine, tartrazine, titanium dioxide or the like. Natural coloring agents may include carotinoids, e.g., beta carotene, riboflavins, chlorophyll, anthocyans, e.g., from red beets, betanin or the like. In the case of use of synthetic coloring

agents, 0.01 wt% to 0.03 wt% coloring agent is typically used, whereas in the case of natural coloring agents, preferably 0.1 wt% to 1 wt% is used.

Suitable fillers include, for example, polydextrose or inulin. Fat substitutes include, for example, caprenin, salatrim or olestra.

Food-compatible organic acids include, for example, citric acid, malic acid, lactic acid, tartaric acid, ascorbic acid or food-compatible acids with a similar effect.

The hard caramels according to this invention may also contain emulsifiers or the like.

The hard caramels according to this invention may of course also contain other sugar alcohols such as 1,6-GPS and 1,1-GPS. In a preferred embodiment, the hard caramels according to this invention also contain at least one other sweetener such as 1,6-GPS, especially 36.5 wt% to 47.5 wt% 1,6-GPS, in addition to the aforementioned quantities of 1,1-GPM and sorbitol, whereby preferably flavoring agents, mannitol, food-compatible acids and/or flavoring agents [sic; repeat] may be incorporated into the hard caramel instead of a small amount of GPS, e.g., an amount of 1 wt% to 8 wt% 1,1-GPS. The caramel according to this invention may preferably be sugar-free, i.e., suitable for use by diabetics and non-cariogenic. However, the caramels may also contain sugars such as sucrose, glucose, fructose or the like.

This invention also relates to a method of producing the hard caramels according to this invention, whereby an aqueous solution or suspension containing an educt mixture of the amounts of 1,1-GPM and sorbitol indicated above, e.g., 52 wt% to 60 wt% 1,1-GPM and 0.5 wt% to 3.5 wt% sorbitol, is heated, evaporated and concentrated to a dry solids content of at least 95 wt%, 96 wt%, 97 wt%, 98 wt% or 99.3 wt%. Then the mixture is cooled and shaped. It is preferably concentrated by evaporating

water by boiling and/or applying a vacuum, e.g., intermittently or continuously. However, the hard caramels may also be produced by melt extrusion.

The hard caramels according to the present invention may be cast or molded and may optionally contain fillings such as maltitol syrup.

Therefore, this invention relates to, for example, hard caramels which contain a sweetener mixture or bulking agent in an amount of 10 wt% to 99 wt%, preferably 90 wt% to 99 wt%, a flavoring substance in an amount of 0.01 wt% to 2.5 wt%, an intense sweetener in an amount of 0.05 wt% to 0.25 wt%, an organic acid in an amount of 0.1 wt% to 5.0 wt% (each based on the total weight of the caramel), water and optionally, in the case of use as a hard caramel which is medicinally active, it may also contain a medicinally active ingredient in an amount of 1.0 mg to 15 mg per unit, for example. It is preferably provided that the aforementioned sweetener mixture has a 1,1-GPM content, which corresponds to a 1,1-GPM content based on the total amount of dry solids of the hard caramel of 52 wt% to 60 wt%. Other substances present in the sweetener mixture may include, as already indicated, 1,6-GPS, 1,1-GPS, mannitol, sorbitol, hydrogenated or non-hydrogenated oligomers or other sweeteners or fillers. The hard caramels according to this invention, as well as hard caramels having a 1,1-GPM content of more than 52 wt%, especially 52 wt% to 80 wt%, are characterized by reduced color production. Therefore, this invention also relates to the use of the aforementioned 1,1-GPM and/or sorbitol amounts, in particular a dry solids content of more than 52 wt% 1,1-GPM, especially 52 wt% to 80 wt%, preferably 52 wt% to 60 wt% 1,1-GPM, in a hard caramel to reduce color production and increase the color stability.

Other advantageous embodiments can be derived from the subclaims.

This invention is explained in greater detail below on the basis of the following examples and the respective figures, which show the following:

Figure 1 the relative water uptake of candy glass bodies and hard caramels having different sorbitol contents, plotted as a function of their 1,1-GPM content,

Figure 2 the relative water uptake of candy glass bodies having various 1,1-GPM contents, plotted as a function of their sorbitol content, and

Figure 3 the reduction in color production in aqueous solutions enriched with 1,1-GPM for production of hard caramels.

Example 1: Production of candy glass bodies

The composition of the bodies of candy glass used is obtained from Table 1 below.

Sample	1,1-GPM content, % based on dry solids	Sorbitol content, % based on dry solids	Initial water content, %	GPS, % based on dry solids	Mannitol, % based on dry solids
1	55.0	0.1	1.4	43.9	1.0
2	54.7	1.1	1.3	42.7	0.7
3	55.1	3.0	0.9	41.0	0.0
4	57.1	0.1	1.4	41.8	0.0
5	56.6	1.0	1.7	40.6	0.6
6	57.1	2.9	1.3	38.7	0.1

Table 1. Composition of the candy glass bodies
(GPS: unless otherwise indicated, in Tables 1 through 3 and in the text, GPS refers to the sum of 1,6-GPS and 1,1-GPS).

The candy glass bodies were prepared as follows. The sweetener mixture of 1,1-GPM, sorbitol, GPS and mannitol was heated to 155 °Celsius to 160 °Celsius with water in a double boiler and exposed to a full vacuum for approximately 1 minute to 1.5 minutes. The mass was then cooled while folding constantly on a cooling table. The cooled plastically shapeable mass was then molded to form bonbons and was cooled further to room temperature. The recipe given above may also be processed on a continuous cooking installation (e.g., Bosch, Klöckner Hänsel) or without the addition of water in a melt extrusion system to form bonbons. Both stamped and molded hard caramels may be produced according to this invention.

Example 2: Stability of bodies of candy glass in storage

The candy glass bodies of Example 1 were stored open in a relative atmospheric humidity of 80% at 25°C. The water uptake by the candy glass bodies was determined each day, the appearance of the candy glass bodies was evaluated, and they were photographed. This permitted unambiguous detection of recrystallization tendencies. Figure 1 shows the water uptake by the candy glass bodies after 3 days, whereby the candy glass bodies contain 1 wt% to 1.4 wt% or 3 wt% sorbitol, plotted here as a function of the 1,1-GPM content. Candy glass bodies containing approximately 1 wt% to 1.4 wt% sorbitol show an unexpected but definite reduction in water uptake and recrystallization at a 1,1-GPM content of approximately 56 wt% to 60 wt%. Especially at a 1,1-GPM content of approximately 57 wt%, there is an especially pronounced reduction in water uptake and recrystallization. Hard caramels with a sorbitol content of approximately 3 wt% have a clearly defined minimum water uptake and recrystallization at a 1,1-GPM content in the range of 54 wt% to 56 wt%, especially 55 wt%.

Example 3: Production of hard caramels

Hard caramels were produced according to the recipe given in Table 2 below.

Sample	1,1-GPM content, % based on dry solids	Sorbitol content, % based on dry solids	Initial water content %	Mannitol content, % based on dry solids	GPS content, % based on dry solids
1	51.2	1.4	1.0	0.6	45.2
2	55.1	1.4	1.0	0.6	41.5
3	50.4	3.5	0.8	1.7	41.6
4	54.6	3.0	1.0	1.5	38.9

Table 2. Composition of the hard caramels.

The sweetener mixture consisting of 1,1-GPM, sorbitol, GPS and mannitol to which was added a mixture of up to 4% (based on dry solids) consisting of natural fruit concentrate, intense sweeteners, flavorings and coloring agents, was boiled with water on a continuous cooking installation at a temperature of 155 °Celsius to 160 °Celsius. To evaporate the water, the mass was exposed to a full vacuum for up to 5 minutes. The mass, cooled to 124 °Celsius to 146 °Celsius by evacuation, was folded on a cooling belt, cooled further to form a plastically shapeable mass in a controlled manner and stamped in an stamping line. Then the hard caramels were cooled further in a cooling tunnel. The recipe given above may also be processed intermittently or without the addition of water by melt extrusion to form bonbons. Both molded and stamped hard caramels can be produced according to this invention.

Example 4: Storage stability of the hard caramels

The hard caramels produced in Example 3 were stored open in Petri dishes at 80% relative atmospheric humidity at 25 °Celsius, weighed each day, evaluated and photographed.

Figure 1 shows the water uptake by the hard caramels after three days, where the hard caramels contained 1.4 wt% or 3 wt% to 3.5 wt% sorbitol with various 1,1-GPM contents. Figure 1 shows that not only with the candy glass bodies but also with hard caramels, an increase in the 1,1-GPM content from approximately 50 wt% to 51 wt% to values of 52 wt% to 60 wt%, especially 54 wt% to 55 wt% led to a definite reduction in water uptake. The reduction in water uptake with the hard caramels was comparable in extent and progression to that of corresponding bodies of candy glass.

The visual examination of the four hard caramels produced according to Table 2 after two and three days revealed the following. It can be seen that there is a correlation between the reduced water uptake, the reduction in crystallization and the improved storage stability. Hard caramels containing 50 wt% to 51 wt% 1,1-GPM and 1.4 wt% to 3.5 wt% sorbitol are already completely recrystallized at the surface after only two days under the aforementioned conditions. Hard caramels containing 54 wt% to 55 wt% 1,1-GPM and 3 wt% sorbitol do not show any visible recrystallization. Hard caramels containing 54 wt% to 55 wt% 1,1-GPM and 1.4 wt% sorbitol are also not completely recrystallized but they do have small areas of recrystallization at the surface.

In the case of the bodies of candy glass, the correlation between the uptake of water and the phenomenon of recrystallization of the amorphous test bodies can again be discerned. After a storage period of one day, the bodies of candy glass containing 3 wt% and approximately 55 or 57 wt% 1,1-GPM did not show any signs of recrystallization. Hard caramels

containing 50 wt% to 51 wt% 1,1-GPM at this sorbitol content showed definite areas of recrystallization after just one day. After three days, the bodies of candy glass containing 57 wt% 1,1-GPM had a recrystallized surface, although only slightly. The bodies of candy glass containing 55 wt% 1,1-GPM were still glassy after three days. Even in the case of the candy glass bodies containing 1 wt% to 1.4 wt% sorbitol, there was a reduction in recrystallization, as expected according to the actual water uptake. The sample containing 55 wt% 1,1-GPM had some recrystallization, while [the sample] containing 57 wt% 1,1-GPM still appeared to be glassy.

Figure 2 shows that candy glass bodies having a 1,1-GPM content of 50 wt% to 51 wt% have a clearly higher water uptake than the candy glass bodies according to this invention, regardless of sorbitol content. Figure 2 also shows that candy glass bodies having a 1,1-GPM content of 54 wt% to 55 wt% show a continuous improvement in the relative water uptake with an increase in sorbitol content beyond approximately 1 wt% to 1.2 wt%. The water uptake of candy glass bodies containing 55 wt% 1,1-GPM and 3 wt% sorbitol is approximately the same as the water uptake observed with sorbitol-free isomalt candy glass bodies.

If the sorbitol content is in the range between 0.8 wt% and 1.8 wt%, then the water uptake of the candy glass bodies at a 1,1-GPM content of approximately 56 wt% to 60 wt% is especially minimized. If the sorbitol content is in the range between 1.8 wt% and 3.5 wt%, then the water uptake with a 1,1-GPM content of approximately 54 wt% to 58 wt%, especially 54 wt% to 56 wt%, is minimized in particular. Hard caramels containing 3 wt% sorbitol and approximately 55 wt% 1,1-GPM have a much lower tendency toward recrystallization than hard caramels containing only 1 wt% to 1.5 wt% sorbitol at the same 1,1-GPM content. Hard caramels having a 1,1-GPM content of more than 60 wt% are characterized by a tendency to crystallize on cooling of the

melt. This crystallization tendency is not desirable in production of hard caramels by solidification of a melt to form an amorphous body.

Example 5: Reduction in color production

In addition to the advantages mentioned above, mixtures of 1,1-GPM, sorbitol and GPS that are used to produce hard caramels also have reduced color production when the GPM content is increased in comparison with that of a 1:1 mixture of GPM and GPS. This is illustrated in Figure 3 on the example of a solution containing 55.0 wt% 1,1-GPM (based on dry solids) and 3.5 wt% sorbitol.

The color production was measured as follows. The color production of an aqueous solution of 75 wt% isomalt and 75 wt% isomalt with an elevated 1,1-GPM content in completely deionized water was tracked over a period of 21 days at 80 °Celsius. The color of the filtered solution was measured in ICUMSA units at 420 nm.

The advantage of GPM-enriched isomalt or isomalt containing more than 52% GPM is that unwanted discoloration of the bonbons produced with this substance is minimized; this is advantageous especially when the sorbitol content is high, e.g., 3.5 wt%. This is also advantageous when an unwanted yellow coloration has a visible influence on the desired color impression, e.g., in the case of blue or colorless bonbons.

Composition of the solutions for the color measurement:

	Isomalt	Isomalt with elevated 1,1-GPM content
1,1-GPM, % based on dry solids	48.4	55.0
GPS, % based on dry solids	46.3	39.0
Sorbitol, % based on dry solids	0.2	3.5
Mannitol, % based on dry solids	0.1	1.8

Table 3. Composition of the solutions.

Figure 1. Water uptake after three days (stored open at 25 °Celsius, 80% relative humidity)

[ordinate] Relative water uptake, % (based on initial mass)

[abscissa] 1,1-GPM content, % dry solids
[legend]

-▲- Candy glass body, 1 to 1.4% sorbitol, dry solids
-■- Candy glass body, 3% sorbitol, dry solids
-△- Hard caramel, 1.4% sorbitol, dry solids
-□- Hard caramel, 3 to 3.5% sorbitol, dry solids

Figure 2. Water uptake after three days (stored open at 25 °Celsius, 80% relative humidity)
[ordinate] Relative water uptake, % (based on initial mass)

[abscissa] Sorbitol content, % dry solids

[legend]
-◆- Candy glass body, 50% to 51% 1,1-GPM, dry solids
-●- Candy glass body, 54% to 55% 1,1-GPM, dry solids
-▲- Candy glass body, 56% to 57% 1,1-GPM, dry solids

Figure 3. Color in solution, 80 °Celsius, completely deionized water

[ordinate] Color, ICUMSA units

[abscissa] Time in days
[legend]

-●- Isomalt, 48.4 wt% 1,1-GPM, 0.2 wt% sorbitol
-▲- Isomalt, 55.0 wt% 1,1-GPM, 3.5 wt% sorbitol

Claims

1. Hard caramel containing 1,1-GPM (1-O-α-D-glucopyranosyl-D-mannitol) in an amount of 52 wt% to 60 wt% (based on the total dry solids of the hard caramel) and sorbitol in an amount of 0.5 wt% to 3.5 wt%.

2. Hard caramel according to Claim 1, wherein the 1,1-GPM content is 54 wt% to 58 wt%.

3. Hard caramel according to Claim 2, wherein the 1,1-GPM content is 55 wt% to 57 wt%.

4. Hard caramel according to one of the preceding Claims, wherein the sorbitol content is 1 wt% to 1.5 wt%.

5. Hard caramel according to one of Claims 1 through 3, wherein the sorbitol content is 1.8 wt% to 3.5 wt%.

6. Hard caramel according to one of Claims 1 and 2, wherein the 1,1-GPM content is 54 wt% to 56 wt% and the sorbitol content is 1.8 wt% to 3.5 wt%.

7. Hard caramel according to Claim 6, wherein the 1,1-GPM content is 55 wt% and the sorbitol content is 3 wt%.

8. Hard caramel according to Claim 1, wherein the 1,1-GPM content is 56 wt% to 60 wt% and the sorbitol content is 0.8 wt% to 1.8 wt%.

9. Hard caramel according to one of the preceding Claims, wherein the hard caramel contains sweeteners, fillers, flavoring agents, coloring agents, flavor enhancers, medicinally active ingredients, food-compatible acids, fat substitutes, mineral salts and/or intense sweeteners.

10. Hard caramel according to one of the preceding Claims, wherein the hard caramel contains at least one additional sweetener, especially 36.5 wt% to 47.5 wt%, selected from the group consisting of 1,6-GPS (6-O-α-D-glucopyranosyl-D-sorbitol), 1,1-GPS (1-O-α-D-glucopyranosyl-D-sorbitol), mannitol and hydrogenated or non-hydrogenated oligosaccharides

11. Method of producing a hard caramel according to one of the preceding Claims, wherein an aqueous solution or suspension of a mixture containing 1,1-GPM and sorbitol, especially containing 52 wt% to 60 wt% 1,1-GPM and 0.5 wt% to 3.5 wt% sorbitol, is evaporated under the influence of heat, then cooled and molded, yielding a hard caramel.

12. Method of producing a hard caramel according to one of the Claims 1 through 10, wherein a mixture containing 1,1-GPM and sorbitol, especially containing 52 wt% to 60 wt% 1,1-GPM and 0.5 wt% to 3.5 wt% sorbitol, is melt extruded, cooled and molded, yielding a hard caramel.

Abstract

The present invention relates to hard caramels having improved storage properties.

Fig. 3

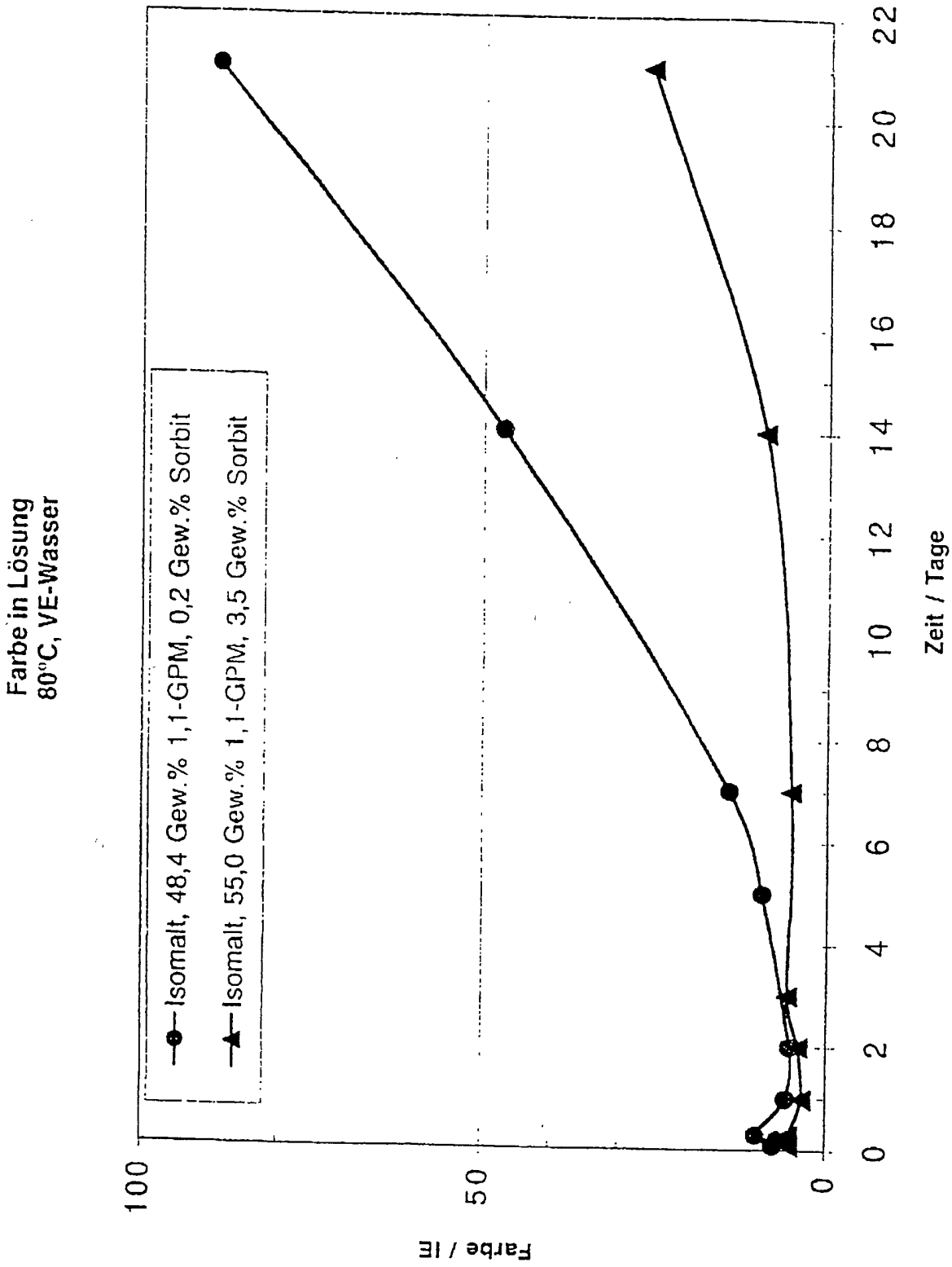

Farbe in Lösung
80°C, VE-Wasser
Isomalt, 48,4 Gew.% 1,1-GPM, 0,2 Gew.% Sorbit
Isomalt, 55,0 Gew.% 1,1-GPM, 3,5 Gew.% Sorbit
Farbe / IE
100
50
0
Zeit / Tage
0
2
4
6
8
10
12
14
16
18
20
22

Fig. 1

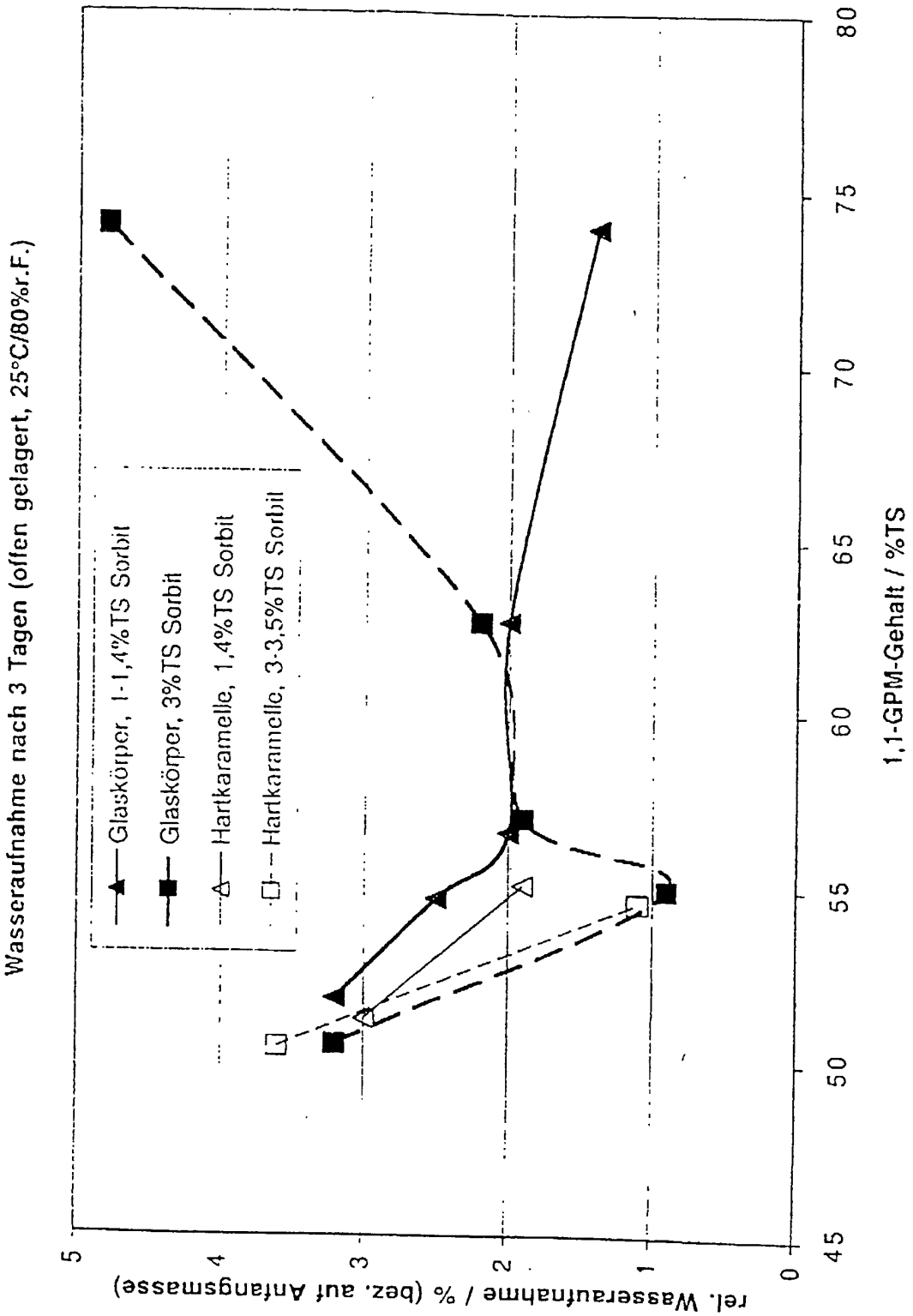
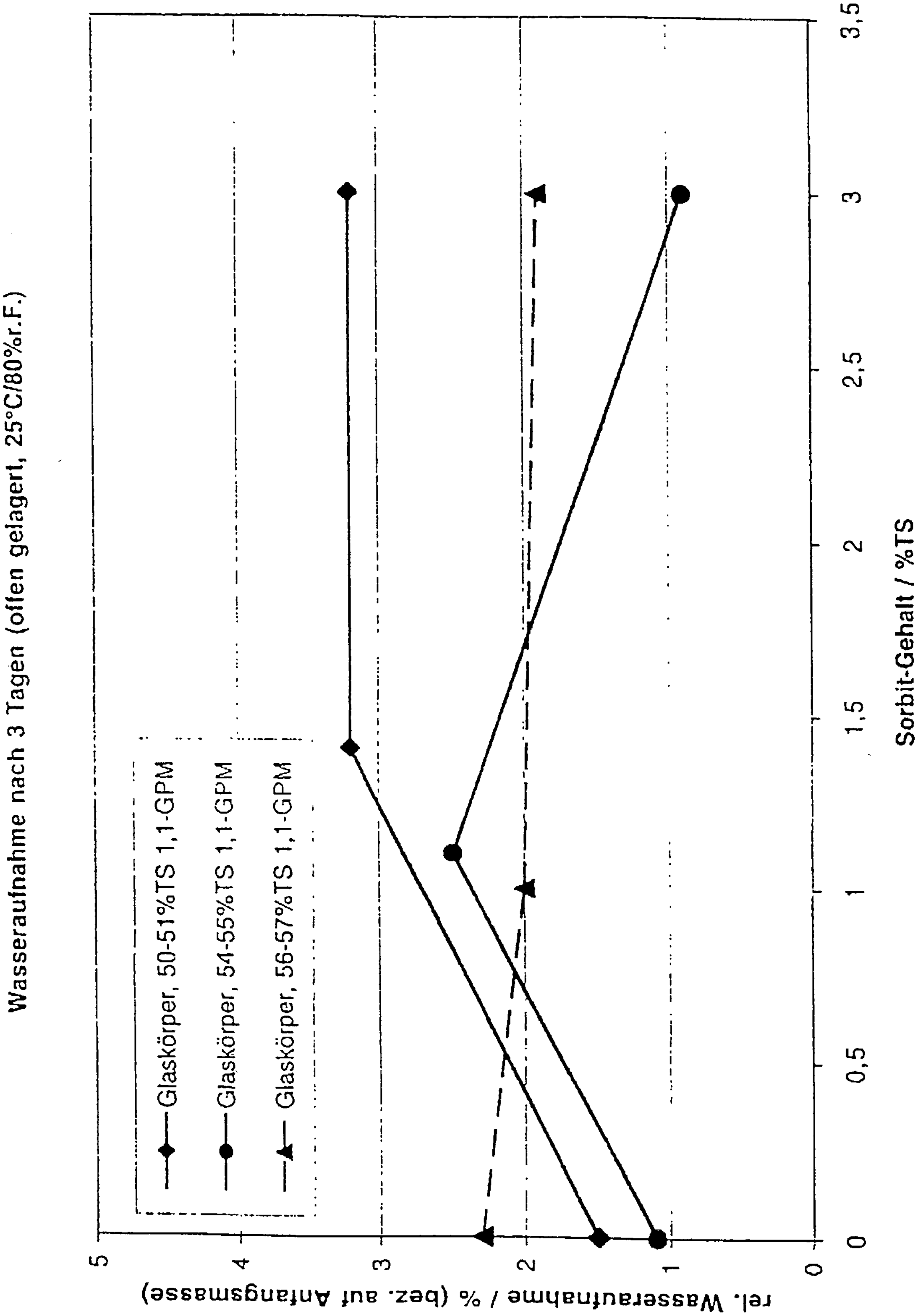

Wasseraufnahme nach 3 Tagen (offen gelagert, 25°C/80%r.F.)
rel. Wasseraufnahme / % (bez. auf Anfangsmasse)
1,1-GPM-Gehalt / %TS
Glaskörper, 1-1,4%TS Sorbit
Glaskörper, 3%TS Sorbit
Hartkaramelle, 1,4%TS Sorbit
Hartkaramelle, 3-3,5%TS Sorbit
0
1
2
3
4
5
45
50
55
60
65
70
75
80

Fig. 2


Wasseraufnahme nach 3 Tagen (offen gelagert, 25°C/80%r.F.)
Glaskörper, 50-51%TS 1,1-GPM
Glaskörper, 54-55%TS 1,1-GPM
Glaskörper, 56-57%TS 1,1-GPM
rel. Wasseraufnahme / % (bez. auf Anfangsmasse)
Sorbit-Gehalt / %TS
0
1
2
3
4
5
0
0,5
1
1,5
2
2,5
3
3,5

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

HARD CANDY WITH IMPROVED STORAGE STABILITY

the specification of which
☐ is attached and/or
☐ was filed on September 9, 2000 as United States Application Serial No. or
☒ PCT International Application No. PCT/EP00/08815.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate or § 365(a) of any PCT international application(s) designating at least one country other than the United States, listed below and have also identified below, any foreign application(s) for patent or inventor's certificate, or any PCT International application(s) having a filing date before that of the application(s) of which priority is claimed:

Country	Application Number	Date of Filing	Priority Claimed Under 35 U.S.C. 119
Germany	199 45 481.7	September 22, 1999	☒ YES ☐ NO
			☐ YES ☐ NO

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below:

Application Number	Date of Filing

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) or § 365(c) of any PCT International application(s) designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application(s) and the national or PCT International filing date of this application:

Application Number	Date of Filing	Status (Patented, Pending, Abandoned)

I hereby appoint the following attorney and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. **FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P., CUSTOMER NUMBER 22,852.** Douglas B. Henderson, Reg. No. 20,291; Ford F. Farabow, Jr., Reg. No. 20,630; Arthur S. Garrett, Reg. No. 20,338; Donald R. Dunner, Reg. No. 19,073; Brian G. Brunsvold, Reg. No. 22,593; Tipton D. Jennings, IV, Reg. No. 20,645; Jerry D. Voight, Reg. No. 23,020; Laurence R. Hefter, Reg. No. 20,827; Kenneth E. Payne, Reg. No. 23,098; Herbert H. Mintz, Reg. No. 26,691; C. Larry O'Rourke, Reg. No. 26,014; Albert J. Santorelli, Reg. No. 22,610; Michael C. Elmer, Reg. No. 25,857; Richard H. Smith, Reg. No. 20,609; Stephen L. Peterson, Reg. No. 26,325; John M. Romary, Reg. No. 26,331; Bruce C. Zotter, Reg. No. 27,680; Dennis P. O'Reilley, Reg. No. 27,932; Allen M. Sokal, Reg. No. 26,695; Robert D. Bajefsky, Reg. No. 25,387; Richard L. Stroup, Reg. No. 28,478; David W. Hill, Reg. No. 28,220; Thomas L. Irving, Reg. No. 28,619; Charles E. Lipsey, Reg. No. 28,165; Thomas W. Winland, Reg. No. 27,605; Basil J. Lewris, Reg. No. 28,818; Martin I. Fuchs, Reg. No. 28,508; E. Robert Yoches, Reg. No. 30,120; Barry W. Graham, Reg. No. 29,924; Susan Haberman Griffen, Reg. No. 30,907; Richard B. Racine, Reg. No. 30,415; Thomas H. Jenkins, Reg. No. 30,857; Robert E. Converse, Jr., Reg. No. 27,432; Clair X. Mullen, Jr., Reg. No. 20,348; Christopher P. Foley, Reg. No. 31,354; John C. Paul, Reg. No. 30,413; Roger D. Taylor, Reg. No. 28,992; David M. Kelly, Reg. No. 30,953; Kenneth J. Meyers, Reg. No. 25,146; Carol P. Einaudi, Reg. No. 32,220;

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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